

Amendments to the Drawings

Figs. 3, 4, and 7 have been amended in order to further clarify the claimed invention. Replacement sheets for the originally filed drawing sheets on which a figure has been amended are included herewith.

Attachment: Replacement Sheets containing amended Figs. 3, 4, and 7

REMARKS

Claims 1-4, 12, and 13 have been amended. Claims 16-31 were canceled. Claims 32-46 have been added. Claims 1-15 and 32-46 are pending in the case. Further examination and reconsideration of pending claims 1-15 and 32-46 are respectfully requested.

Objections to the Drawings

The Office Action states that “The drawings are objected to because suitable descriptive labels are required in box 20, 30, 36, 38, and 40 (see Fig. 3) and 48, 52 (see Fig. 2).” (Office Action -- page 4). The drawings have been amended to include suitable descriptive labels in boxes 20, 30, 36, 38, and 40 of Fig. 3 and boxes 48 and 52 of Fig. 4. Accordingly, entrance of the amendments to Figs. 3 and 4 and removal of these objections to the drawings are respectfully requested.

The drawings were also objected to under 37 CFR 1.83(a) as not showing every feature of the invention specified in the claims. In particular, the Office Action states that “the ‘feedback control technique’ in claim 14, and the ‘feedforward control technique’ claim 15, must be shown or the feature(s) canceled from the claims.” (Office Action -- page 4). Fig. 7 has been amended to show the features of claims 14 and 15. Support for the amendments to Fig. 7 can be found in the Specification, for example, on page 16, line 21 to page 24, line 25. As such, the amendments to the drawings do not present new matter. Accordingly, entrance of the amendments to Fig. 7 and removal of these objections to the drawings is respectfully requested.

Section 112, first paragraph, Rejections

Claims 14-15 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Applicant respectfully traverses these rejections.

In particular, the Office Action states that “Feedback control technique recited in claim 14, and feedforward control technique recited in claims 15 are not disclosed in the specification.” (Office Action -- page 6). However, support for claims 14-15 can be found in the Specification, for example, on page 8, lines 1-4 and page 25, lines 8-24. The description of the invention provided in the Specification is itself

sufficient to permit those skilled in the art to make and use the invention. Detailed procedures for making and using the invention may not be necessary if the description of the invention itself is sufficient to permit those skilled in the art to make and use the invention. MPEP 2164. In addition, the Specification meets the enablement requirement since based on the description provided in the Specification the experimentation needed to practice the invention is not undue or unreasonable. The standard for determining whether the specification meets the enablement requirement was cast in the Supreme Court decision of *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916) which postured the question: is the experimentation needed to practice the invention undue or unreasonable? That standard is still the one to be applied. *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). MPEP 2164.01. Furthermore, given the level of knowledge and skill in the art, one skilled in the art would be able to practice the claimed invention based on the description of the invention provided in the Specification. All that is necessary is that one skilled in the art be able to practice the claimed invention, given the level of knowledge and skill in the art. See, e.g., *In re Fisher*, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970). MPEP 2164.08.

For at least the reasons set forth above, claims 14-15 comply with the enablement requirement. Accordingly, removal of the § 112, first paragraph, rejections of claims 14-15 is respectfully requested.

Section 102 Rejections

Claims 1, 5-11, and 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,995,216 to Yun. (hereinafter “Yun”). Claims 1 and 2 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,812,756 to Curtis et al. (hereinafter “Curtis”). As will be set forth in more detail below, the § 102 rejections of claims 1, 2, 5-11, and 14 are respectfully traversed.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987), MPEP § 2131. The cited art does not disclose all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

The cited art does not teach determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique. Amended independent claim 1 recites in part:

obtaining a charge density measurement of the insulating film using a non-contact technique; obtaining a voltage measurement of a surface voltage potential of the insulating film relative to a bulk voltage potential of the substrate corresponding to the charge density measurement using a non-contact technique; obtaining a rate of voltage decay of the voltage measurement using a non-contact technique; determining the one or more properties of the insulating film using the charge density measurement, the voltage measurement, and the rate of voltage decay, wherein the one or more properties comprise a thickness of the insulating film.

Support for the amendments to claim 1 can be found in the claims as originally filed, for example, in claims 4 and 17.

Yun discloses a technique for measuring surface states in metal-insulator-semiconductor structures. Yun, however, does not disclose determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique. For example, Yun states that “A dielectric 10 under test, as shown in FIG.1 has a metal electrode 11 on one surface thereof and a semiconductor body that serves as a charge injection source 12 on the opposite surface thereof.” (Yun -- col. 4, lines 54-57). Yun also states that “upon application of sufficient voltage across the dielectric body having electrodes attached thereto a finite conduction current can be caused to flow in the dielectric.” (Yun -- col. 3, lines 54-57). In addition, Yun states that “the amplitude of the semiconductor surface potential are dependent on the amount of injected charge actually trapped in the insulator.” (Yun -- col. 4, lines 16-18). Therefore, Yun discloses obtaining measurements of a dielectric using a contact technique. However, Yun does not disclose obtaining measurements of a dielectric using a non-contact technique. As such, Yun does not teach determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique, as recited in claim 1. Therefore, Yun does not teach all limitations of claim 1.

Curtis discloses a contactless technique for semiconductor wafer testing. Curtis, however, does not disclose determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique. For example, Curtis states that “The speed of this decay is a measure of the number of defects and contamination in the

semiconductor wafer.” (Curtis -- col. 7, lines 3-5). Curtis also states that “A third important parameter which may be measured utilizing the present charge distribution configuration is the epi doping concentration on semiconductor wafer products.” (Curtis -- col. 10, lines 3-6). Although Curtis discloses determining the number of defects and contamination and doping concentration of a wafer, Curtis does not teach determining a thickness of an insulating film. As such, Curtis does not teach determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique, as recited in claim 1. Therefore, Curtis does not teach all limitations of claim 1.

For at least the reasons set forth above, independent claim 1, as well as claims 2, 5-11, and 14, which are dependent therefrom, are not anticipated by the cited art. Accordingly, removal of the § 102 rejections of claims 1, 2, 5-11, and 14 is respectfully requested.

Section 103(a) Rejections

Claims 3 and 4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yun in view of U.S. Patent No. 6,600,333 to Martin et al. (hereinafter “Martin”). Claims 12 and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Yun in view of U.S. Patent No. 6,486,682 to Wang et al. (hereinafter “Wang”). Claim 15 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Yun in view of U.S. Patent No. 6,665,623 to Pasadyn et al. (hereinafter “Pasadyn”). As will be set forth in more detail below, the § 103 rejections of claims 3, 4, 12, 13, and 15 are respectfully traversed.

Pasadyn is not available as prior art against the present claims. The present application claims priority to U.S. Provisional Patent Application No. 60/394,835 filed on July 10, 2002. Therefore, the present application has a priority date of July 10, 2002. In contrast, Pasadyn was filed on July 31, 2002. As such, the priority date of the present application is earlier than the filing date of Pasadyn. As a result, Pasadyn is not available as prior art against the present claims. Consequently, Pasadyn cannot be used in combination with any other cited art as suggested in the Office Action to reject the present claims. Accordingly, removal of the § 103 rejections of the claims over Yun in view of Pasadyn is respectfully requested.

To establish *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP

2143.03. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond*, 910 F.2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). The cited art does not teach or suggest all limitations of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

The remaining available cited art does not teach or suggest determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique, as recited in claim 1. For at least the reasons set forth above, Yun does not teach all limitations of claim 1. In addition, for at least the reasons set forth above, Yun does not suggest all limitations of claim 1. Furthermore, Martin and/or Wang cannot be combined with Yun to overcome deficiencies contained therein.

In particular, Martin discloses a method and test structure for characterizing sidewall damage in a semiconductor device. Martin, however, does not disclose determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique. For example, Martin states that “The contact pads 45, 60 are suitable areas to which an electrical probe may be attached for testing the electrical characteristics of the test structure 10.” (Martin -- col. 2, lines 40-43). Therefore, Martin discloses obtaining measurements of a test structure using a contact technique. However, Martin does not disclose obtaining measurements of a test structure using a non-contact technique. As such, Martin does not teach or suggest determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique, as recited in claim 1. Therefore, Martin does not teach or suggest all limitations of claim 1 and cannot be combined with Yun to overcome deficiencies contained therein.

Wang discloses the determination of dielectric constants of thin dielectric materials in a MOS (metal oxide semiconductor) stack. Wang, however, does not disclose determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique. For example, Wang states that “in a general aspect of the present invention, the dielectric constants of the interfacial structure and the high-K structure forming a MOS (metal oxide semiconductor) stack are determined by forming test MOS (metal oxide semiconductor) stacks.” (Wang -- col. 2, lines 7-11). Wang also states that “in a metal oxide semiconductor (MOS) stack

100, a conductive structure 102 comprised of a metal (or other types of conductive material such as polysilicon for example) is formed on a high-K structure 104 comprised of a dielectric material.” (Wang - col. 1, lines 22-26). Therefore, Wang discloses a test structure similar to that disclosed by Yun. As such, although Wang does not disclose using any specific measurement technique for the test structure, it would be obvious to one of ordinary skill in the art that an appropriate measurement technique for the test structure of Wang is not a non-contact technique, but a contact measurement technique such as that disclosed by Yang and set forth in more detail above. As such, Wang does not teach or suggest determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique, as recited in claim 1. Therefore, Wang does not teach all limitations of claim 1 and cannot be combined with Yun and/or Martin to overcome deficiencies contained therein.

For at least the reasons set forth above, none of the cited art, either individually or in any combination thereof, teaches or suggests determining a thickness of an insulating film using a charge density measurement, a voltage measurement, and a rate of voltage decay, which are obtained using a non-contact technique, as recited in claim 1. Consequently, the cited art does not teach or suggest all limitations of claim 1.

For at least the reasons stated above, independent claim 1, as well as claims 3, 4, 12, 13, and 15, which are dependent therefrom, are patentably distinct over the cited art. Accordingly, removal of the § 103 rejections of claims 3, 4, 12, 13, and 15 is respectfully requested.

Patentability of the Added Claims

Claims 32-46 have been added. Independent claim 32 recites, in part: “a measurement device configured to perform measurements on the insulating film using a non-contact technique; and a processor coupled to the measurement device, wherein the processor is configured to: receive input from the measurement device,...determine the one or more properties of the insulating film using the input, wherein the one or more properties comprise a thickness of the insulating film.” Support for claim 32 can be found in the Specification, for example, on page 5, line 11 to page 6, line 24, page 13, line 29 to page 16, line 19, and page 23, line 23 to page 25, line 24. Claims 33-46 depend from claim 32. Support for these claims can be found in the Specification, for example, on page 4, lines 14 to page 28, line 22.

For at least the reasons set forth above, the available cited art does not teach or suggest a processor configured to determine a thickness of an insulating film using input received from a measurement device, which is configured to perform measurements using a non-contact technique, as recited in claim 32. Therefore, independent claim 32, as well as claims 33-46, which are dependent therefrom, are patentably distinct over the cited art. Accordingly, allowance of claims 32-46 is respectfully requested.

CONCLUSION

This response constitutes a complete response to all issues raised in the Office Action mailed February 18, 2005. In addition, the art cited but not relied upon is not believed to be pertinent to the patentability of the present claims. In view of the remarks presented herein, Applicants assert that pending claims 1-15 and 32-46 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned earnestly requests a telephone conference.

The Commissioner is authorized to charge any fees, which may be required, or credit any overpayment, to deposit account number 50-3268/5589-03501.

Respectfully submitted,



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